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(54) INK JET RECORDING MEDIUM

## (57)Abstract:

PROBLEM TO BE SOLVED: To form an ink receptive layer of a laminar structure consisting of at least, one layer with a top layer containing colloidal silica having high luster and high density as one peak of the pore distribution curve of the top layer represents the specific value of a pore diameter.

SOLUTION: This ink jet recording medium consists of an ink receptive layer provided on a sheet-like support such as film. The ink receptor of this medium is of the laminar structure having at least, one layer, and at least, the top layer of this structure contains colloidal silica. In addition, at least, one peak of the pore distribution curve of the top layer of the ink receptive layer is set to 2-100nm. If the position of the peak of the pore distribution curve is equivalent to a less value than this 2-100nm range, the ink absorptive rate is low. On the other hand, if the position of the peak of the pore distribution curve is equivalent to a higher value than 100nm, the ink is apt to easily spread and therefore, a delicate dot cannot be obtained. Further, the surface of the ink jet recording medium appears to be coarse and might lose a smoothness. Besides, if an adhesive is added to the top layer, the colloidal silica hardly becomes condensed in a dispersing liquid, so that the colloidal silica needs to be dispersed in the state of a primary particle.

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CLAIMS

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[Claim(s)]

[Claim 1] It is the ink jet record object which this ink absorbing layer has the lamination of one or more layers in the ink jet record object which established the ink absorbing layer in the base material, and the maximum upper layer at least is a layer containing colloidal silica, and is characterized by there being at least one peak of the pore distribution curve of this maximum upper layer in the pore diameter of 2nm - 100nm.

[Claim 2] It is the ink jet record object which this ink absorbing layer has the lamination more than two-layer in the ink jet record object which established the ink absorbing layer in the base material, and is characterized by for the maximum upper layer and the 2nd layer at least being layers containing colloidal silica, and there being the maximum upper layer of this ink absorbing layer and the 2nd layer of at least one peak of a pore distribution curve in the pore diameter of 2nm - 100nm.

[Claim 3] The layer containing colloidal silica is an ink jet record object according to claim 1 or 2 whose solid content weight ratios of colloidal silica and adhesives adhesives are contained and are 4 / 1 - 50/1.

[Claim 4] Claim 1 which a base material comes to imprint through the interlayer who has adhesiveness or an adhesive property after application membrane formation of the ink absorbing layer is carried out in a molding side, an ink jet record object according to claim 2 or 3.

[Claim 5] Claims 1, 2, and 3 which have the peak of the pore distribution curve of the maximum upper layer in the pore diameter of only 2nm - 100nm, or an ink jet record object given in four.

[Claim 6] The ink jet record object according to claim 1, 2, 3, 4, or 5 characterized by for an ink absorbing layer having the lamination more than two-layer, and the peak of the pore distribution curve of each class being in the pore diameter of only 2nm - 100nm.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] Especially this invention relates to the ink jet record object which is excellent in high-glossiness, ink absorptivity, and moisture-proof and a water resisting property about an ink jet record object.

[0002]

[Description of the Prior Art] An ink jet recording method is a method which the liquid ink drop injected at high speed is made to adhere to a recorded material, and records it from a nozzle, and has the descriptions, like full-color-izing being easy and the printing noise are low. By this method, since the ink used contains a lot of solvents, in order to obtain high record concentration, it is necessary to use a lot of ink. Moreover, since a liquid ink drop is injected continuously, before the first drop is absorbed, the following drop is injected, and it is easy to produce un-arranging [ that a liquid ink drop unites and the dot of ink joins ]. Therefore, when the concentration of a printing dot being high and a color tone's being brightly skillful as a record object used by this ink jet recording method and absorption of ink are quick and a printing dot laps, it is required that there is no blot of ink etc.

[0003] although approaches, such as controlling pore distribution of a sheet and raising printing fitness by addition of a loading material etc., are proposed in case paper is milled, as indicated by JP,58-110288,A, JP,58-151291,A, and JP,62-55996,A in order to solve these problems -- these approaches -- a manufacturing cost -- being easy -- although there was an advantage, there was a problem which is inferior to the coated paper type which prepares an application layer in image quality etc. far. On the other hand, the coated paper type thing prepared the ink absorbing layer (one layer or multilayer) containing a porous pigment, performed control of the color nature and sharp nature which determine image quality, and has aimed at improvement in color reproduction nature or image repeatability. For example, as indicated by JP,62-111782,A, JP,63-13776,A, and JP,63-104878,A, the ink jet record object which added the binder and prepared the ink absorbing layer was proposed, using as a pigment the primary particle or aggregated particle which has pore.

[0004] Furthermore, in order to raise a quality of printed character and to gather ink rate of absorption as indicated by JP,63-22977,B, the ink which prepared the pore which has a peak at 0.2-10micro, and was absorbed is incorporated in the maximum upper layer of an ink absorbing layer in the opening which consists of 0.05 micrometers or less of apertures, and what offers the ink jet record object with which high definition is obtained more is mentioned. However, corresponding to the rapid spread of ink jet printers, the printed matter of the photograph average which has high gloss for applications, such as various publications and a package, is called for in the printing field. Especially in color record, needs the film from the point of ink acceptance nature, such as absorption of ink, a fixing rate, and ink absorption capacity, and coated paper type are high in the configuration (the shape of a perfect circle) of a dot, and the sharpness of a dot. In order to give porosity, the ink absorbing layer shown above needs to enlarge the pigment itself, or needs to enlarge a secondary particle. When the pigment became large, transparency of light can be prevented, an ink absorbing layer becomes opaque, and it has

gloss, and the smooth nature of the front face of an ink absorbing layer is not only obtained, but it was not able to acquire about the same beautiful color record as a photograph.

[0005] Although a certain amount of [ although many record objects for ink jets which applied the resin which absorbs ink by the dissolution and swelling in order to give gloss are marketed / the thing which is going to make it absorb ink by the dissolution and swelling of such resin ] gloss is acquired, the rate of drying of ink is slow and moisture-proof and a water resisting property are not good, either.

[0006] Many ink jet record forms which have the ink absorbing layer formed in pigments, such as a silica, an alumina, pseudo-boehmite, a calcium carbonate, and a kaolin, considering water soluble polymers, such as starch, polyvinyl alcohol, and a cellulosic, as adhesives as an ink jet record object which prepared the pigment content layer are reported. Although the water resisting property of these ink absorbing layers is excellent, generally there are not smooth nature and glossiness. For example, as indicated by JP,61-60793,B and JP,2-274587,A, a synthetic silica, colloidal silica, and water soluble polymer adhesives constitute the ink absorbing layer. However, in order to maintain ink absorptivity, content of a synthetic silica with a comparatively large particle size is indispensable. Generally the synthetic silica had a large particle size, and it was difficult to acquire smooth nature and glossiness.

[0007] In order to acquire smooth nature and glossiness, carrying out an ink absorbing layer more than two-layer, and using the upper layer as a gloss manifestation layer is proposed (for example, : JP,3-215080,A, JP,3-256785,A, JP,7-89220,A, JP,7-101142,A, JP,7-117335,A, etc.). There are some which are used in the complex of colloidal silica or colloidal silica as a principal component of these gloss manifestation layers. However, since the gloss manifestation layer generally used is prepared rather than ink absorptivity for gloss, it is obtained by cast processing (it is stuck to the mirror plane roll with which a gloss manifestation layer is a damp or wet condition, and was heated by pressure, and comes to carry out specular-gloss finishing). In order to obtain a cast side and an ink transit rate, there are few amounts of applications and, moreover, surface pore is prepared comparatively greatly. If there are few amounts of applications of a gloss manifestation layer, as for the gloss at the time of a blank paper (before record), ink will cover a gloss manifestation layer top after printing of a certain thing, and printing gloss will be hard to be acquired. The gloss with especially gloss of the photograph average is not acquired. Moreover, if surface pore becomes large, the circumference of the dot of the obtained ink will be notched and will become far from the shape of a perfect circle. By it, clearness lacks an image considerably. Moreover, although breadth and the dot to like became large and ink did not become a problem especially on the printing level of 360dpix360dpi, when it became the degree of high line beyond 720dpix720dpi, since the dot was large, the dot and the dot joined and there was a fault from which a delicate image is not obtained.

[0008]

[Problem(s) to be Solved by the Invention] This invention aims at offering high gloss and the high-concentration sheet for ink jet record more, in order to solve these problems.

[0009] Now, if the coated paper type record sheet for ink jets is divided roughly, it can be divided into the following two kinds.

**\*\* Lusterless general ink jet coated paper.** The ink absorbing layer of these coated paper uses secondary particles, such as a silica and an alumina, as a principal component, and as shown in JP,63-22997,B, the peak of a pore distribution curve is in the radius of 0.05micro, and radii 0.2-10micro. However, since what carries out coating of the secondary particle will make an ink absorbing layer front face porous and scatters light, it cannot obtain the image of the photograph tone which has the outstanding glossiness and gloss, and a feeling of transparency.

**\*\* Glossy ink jet coated paper.** Generally the ink absorbing layer of such coated paper is constituted by resin, such as polyvinyl alcohol. Although ink is absorbed by the swelling of resin, it has a fault with large there being no glossy lack and glossy water resisting property etc. The peak of a pore distribution curve is in 2nm or less in such an ink absorbing layer.

[0010] Although the ink absorbing layer which uses a primary particle as a principal component was seldom seen, when this invention persons tried, even if spreading was completed, ink absorptivity and gloss were not able to be balanced easily. In this invention, as a result of



repeating examination wholeheartedly, when adding adhesives to colloidal silica and forming membranes to it, it prevented that carried out reducing the amount of adhesives etc. and the opening between the obtained colloidal silica was closed by adhesives. And when at least one of the magnitude of this opening, i.e., the peak of a pore distribution curve, designs to 2-100nm, high gloss, ink absorptivity, a water resisting property, etc. and the good ink jet record object to satisfy are acquired.

[0011]

[Means for Solving the Problem] In the ink jet record object which established the ink absorbing layer in the base material of the shape of a sheet, such as paper and a film, while an ink absorbing layer has the lamination of one or more layers, the layer containing colloidal silica is prepared and the maximum upper layer at least has at least one peak of the pore distribution curve of the maximum upper layer of an ink absorbing layer in 2-100nm. In still more nearly another mode, a dot is controlled and the outstanding image is obtained. Namely, while said ink absorbing layer has the lamination more than two-layer, the maximum upper layer and the 2nd layer at least carry out the laminating of the layer containing colloidal silica, and as for both the maximum upper layer of an ink absorbing layer, and the 2nd layer, at least one peak of a pore distribution curve exists in 2nm - 100nm. Thus, ink rate of absorption is quick, printing concentration is high, and a high gloss ink jet record object with good water resisting property, ink fixable, and printing fitness is acquired.

[0012] If 2-100nm of at least one peak of the pore of the maximum upper layer of an ink absorbing layer exists in 5-80nm preferably, ink rate of absorption will become quick. In order to obtain the pore of this range, particle size can form by the colloidal silica and the adhesives content layer which are 10nm - 300nm. The application layer which has the pore of this range is excellent in the smooth nature of an application layer, and its transparency is also good. Ink rate of absorption becomes it slow that the peak location of pore distribution is a small location. On the other hand, if the peak location of pore distribution exceeds 100nm, neither breadth nor the delicate dot to like will be obtained for ink. Moreover, a feeling of ZARATSUKI arises on a front face, and there is a possibility of spoiling smooth nature. Furthermore, if an ink absorbing layer has the lamination more than two-layer, it is the layer in which two-layer contains colloidal silica at least and at least one peak of a pore distribution curve sets the maximum upper layer of this ink absorbing layer, and the 2nd layer to 2nm - 100nm the quantity which can be prevented in the breadth of a dot and has a feeling of gloss by high concentration more since the ink (especially color overlapping part) which cannot be absorbed in the maximum upper layer is absorbed by the 2nd layer and the pore of the 2nd layer also has it in 2nm - 100nm -- a delicate printing dot is obtained. moreover, an ink absorption layer -- overall smooth nature and transparency not only improve, but color record of a beautiful photograph tone is acquired.

[0013] Furthermore, if the ink absorbing layer of the ink jet record object of this invention is constituted by colloidal silica and water soluble polymer adhesives, the ink absorbing layer excellent in transparency and ink absorptivity will be obtained. It is possible for the feeling of transparence of the printing section to be obtained if the amount of applications of the layer containing colloidal silica carries out to 50% - 100% of all ink absorbing layers, and to acquire about the same gloss as a photograph.

[0014] Moreover, if cation denaturation colloidal silica is used as colloidal silica, an ink jet record object with good ink fixable and moisture-proof shelf life will be acquired. Furthermore, if it imprints on a base material through an adhesive or adhesive interlayer after carrying out application membrane formation of the ink absorbing layer of this invention in a molding side, gloss will improve remarkably and high smoothing and the ink jet record object of high gloss will be acquired more.

[0015] Moreover, when the peak of the pore distribution curve of the maximum upper layer existed in the pore diameter of only 2nm - 100nm, it turned out the breadth of the dot after printing not only becomes small, but that is mostly controlled in the shape of a perfect circle. The ink jet record object which is more excellent in high gloss, high delicacy, and a feeling of gloss is acquired. When an ink absorbing layer is more than two-layer similarly, and the peak of the pore distribution curve of each class exists in the pore diameter of only 2nm - 100nm, a dot

is not only mostly controlled in the shape of a perfect circle, but the ink by the side of high concentration is also absorbed quickly, and the ink jet record object of high gloss in which about the same image as a photograph more near an ideal is possible is acquired.

[0016] Although this invention includes the following operation aspects, it is not restricted to these.

[1] It is the ink jet record object which this ink absorbing layer has the lamination of one or more layers in the ink jet record object which established the ink absorbing layer in the base material, and the maximum upper layer at least is a layer containing colloidal silica, and is characterized by there being at least one peak of the pore distribution curve of this maximum upper layer in the pore diameter of 2nm - 100nm.

[0017] [2] It is the ink jet record object which this ink absorbing layer has the lamination more than two-layer in the ink jet record object which established the ink absorbing layer in the base material, and is characterized by for the maximum upper layer and the 2nd layer at least being layers containing colloidal silica, and there being the maximum upper layer of this ink absorbing layer and the 2nd layer of at least one peak of a pore distribution curve in the pore diameter of 2nm - 100nm.

[0018] [3] The layer containing colloidal silica is an ink jet record object [1] whose solid content weight ratios of colloidal silica and adhesives adhesives are contained and are 4 / 1 - 50/1, or given in [2].

[0019] [4] The ink jet record object given [ above-mentioned / each ] in a term which a base material comes to imprint through the middle class who has adhesiveness or an adhesive property after application membrane formation of the ink absorbing layer is carried out in a molding side.

[0020] [5] The layer containing colloidal silica is an ink jet record object given [ above-mentioned / each ] in a term constituted by colloidal silica and water soluble polymer adhesives.

[6] The ink jet record object given in [5] given water soluble polymer adhesives are poly vinyl alcohol.

[7] The ink jet record object given [ above-mentioned / each ] in a term given colloidal silica is cation denaturation colloidal silica.

[0021] [8] The ink jet record object given [ above-mentioned / each ] in a term given colloidal silica is acid colloidal silica.

[9] The amount of applications of the layer containing colloidal silica is an ink jet record object given [ above-mentioned / each ] in a term which is 50% - 100% of all ink absorbing layers.

[10] The ink jet record object given [ above-mentioned / each ] in a term given average pore volume with a pore diameter of 100nm or less is 0.1-2.5ml/g.

[0022] [11] The ink jet record object given [ above-mentioned / each ] in a term which has at least one peak of the pore distribution curve of the maximum upper layer of an ink absorbing layer in 5-80nm.

[12] The ink jet record object given [ above-mentioned / each ] in a term the given mean diameter of colloidal silica is 10nm - 300nm in the layer containing colloidal silica.

[13] The ink jet record object given in [4] characterized by being at least one as which the interlayer who has adhesiveness or an adhesive property is chosen from thermoplastics, adhesives, and a pressure sensitive adhesive.

[0023] [14] The ink jet record object given [ above-mentioned / each ] in a term with which an ink absorbing layer contains cationic resin.

[15] A molding side is an ink jet record object [4] which is the film which has the Takahira glide plane, a laminated paper, glassine, inorganic glass, and a surface of metal, or given in [13].

[16] The ink jet record object of [1], [2], [3], [4], or each above-mentioned term publication which has the peak of the pore distribution curve of the maximum upper layer in the pore diameter of only 2nm - 100nm.

[17] The ink jet record object given [ above-mentioned / each ] in a term characterized by for an ink absorbing layer having the lamination more than two-layer, and the peak of the pore distribution curve of each class being in the pore diameter of only 2nm - 100nm.

[0024]

[Embodiment of the Invention] Measurement of pore distribution is explained. In this invention, in order to avoid the effect of a base material if possible, the ink absorbing layer was established in polyester film (the Toray Industries [ , Inc. ] make, a trade name: Lumiler T, 75micro), and it used for measurement. Pore distribution is microphone ROMETORIKKUSU. Pore distribution (differential curve) can be calculated and searched for using the pore sizer 9320 (Shimadzu make) from the amount distribution curve of openings searched for with the method of mercury penetration. Measurement of the pore diameter by the method of mercury penetration calculated the cross section of pore using the following formula drawn by assuming as circular.

[0025]  $D = -4\gamma \cos \theta / P$  however D: pore diameter, the surface tension of gamma: mercury, theta: contact angle, P: Consider as a pressure.

[0026] Making surface tension of mercury into 482.536 dyn/cm, the use contact angle was made into 130 degrees, and measured the mercury pressure force in depression (30[ 0 - ] psia, a measurement pore diameter: 360micro-6micro) and the high-pressure section (30000[ 0 - ] psia, a measurement pore diameter: 6micro - 6nm). The average pore volume of an ink absorbing layer is calculated from the weight and the amount distribution curve of openings of an ink absorbing layer which were measured beforehand. In this invention, the peak of pore distribution [ on each class containing colloidal silica ] in 6nm - 100nm is acquired, and \*\*\*\*\* is ended. At this time, the average pore volume of 100nm or less says the average pore volume to 6-100nm. It is measurable ASAPPU about the pore which is 1nm - 100nm when the peak of pore distribution in 6nm - 100nm is not accepted. Continuation measurement was carried out using 2010 (gas absorption method by the Shimadzu make, a high-speed specific surface area / pore distribution measuring device, and the setting-the volume method). The average pore volume at this time says the average pore volume to 1nm - 100nm.

[0027] In this invention, sheets, such as papers, such as films, such as cellophane, polyethylene, polypropylene, plasticized polyvinyl chloride, rigid polyvinyl chloride, and polyester, paper of fine quality, art paper, coat paper, cast coated paper, a metallic paper, kraft paper, a polyethylene laminated paper, an impregnated paper, vacuum evaporation paper, and water-soluble paper, metal foil, and a synthetic paper, are suitably used as a base material, for example.

[0028] Next, detail explanation is given about the ink absorbing layer of this invention. First, the layer containing the colloidal silica which constitutes the ink absorbing layer of this invention is explained.

[0029] The colloidal silica used for the maximum upper layer or the 2nd layer is chosen from anionic [ of general marketing ], cationic colloidal silica, etc., and is used suitably. Moreover, since it excels in practical use sides, such as highly humid shelf life, when cation system colloidal silica is made to contain, it is desirable. When using anionic colloidal silica, acid anion colloidal silica is used preferably. Use of acid anion colloidal silica obtains the ink absorbing layer where transparency is more high. Although a reason is not certain, probably because sodium oxide generally contains in alkaline colloidal silica (most commercial items are this alkaline colloidal silica) and that sodium oxide influences a refractive index, it is thought that it will have a bad influence on transparency.

[0030] Mean particle diameter of the colloidal silica used (surface area is measured with a BET adsorption method, and mean particle diameter is computed.) unless especially the following mean particle diameter is refused -- all -- this approach -- measuring -- 10-300nm is preferably adjusted to 20-200nm. Of course, the blend of two or more sorts of colloidal silica is also possible if needed. If less than 10nm colloidal silica is used, the peak of the acquired pore distribution may be set to less than 2nm, and ink rate of absorption may not be obtained. On the other hand, when the colloidal silica exceeding 300nm is used, the peak of the acquired pore distribution may exceed 100nm, a feeling of transparence is lost, and there is also a possibility that the ink jet record object with which after printing has high gloss may not be acquired. Use of a 20-200nm particle obtains the ink absorbing layer in the range whose at least one of the peaks of pore distribution is 5-80nm in many cases. If it has the pore peak of this range, even if printed at high speed, there will be no problem in ink rate of absorption, and what also has smooth nature, transparency, and a feeling of gloss close to a photograph will be obtained.

[0031] When preparing as an ink absorbing layer, adhesives are made to contain generally, since



colloidal silica itself does not have membrane formation nature. As adhesives (binder), they are conventionally used by the well-known adhesives (binder) generally [ vinyl system polymer latexes, such as a conjugated diene system polymer latex of cellulose, such as polyvinyl alcohol, casein, soybean protein, synthetic protein, starch, a carboxymethyl cellulose, and methyl cellulose, a styrene-butadiene copolymer, and a methyl methacrylate-butadiene copolymer, an acrylic polymer latex, and an ethylene-vinylacetate copolymer, etc. ] used as coated paper, for example, adding suitably.

[0032] In order to obtain an ink absorbing layer with pore distribution of this invention, and gloss, the dispersibility of adhesives and colloidal silica must be good. That is, even if adhesives are added, it is necessary to hardly condense colloidal silica in dispersion liquid, but to distribute it in the state of a primary particle. When colloidal silica condenses, a feeling of ZARATSUKI is in a paint film, and the peak of pore distribution of a paint film also exceeds 100nm, and has a possibility that smooth nature may also be large and may fall, not to mention transparency. From distributed fitness with colloidal silica, water soluble polymer adhesives are desirable and especially polyvinyl alcohol (Following PVA is called) is the most effective.

[0033] As for the solid content weight ratio of colloidal silica and adhesives,  $4 / 1 - 50 / 1$  are desirable, and it is more preferably adjusted by  $20 / 3 - 20 / 1$ . When there are many additions of adhesives, the peak of pore distribution of a paint film not only becomes small, but the average pore volume of the obtained ink absorbing layer tends to become [g] in less than 0.1ml /, ink rate of absorption is slow and there is a possibility that the ink by the side of high concentration cannot be absorbed. On the other hand, when there are too few additions of adhesives, there is also a possibility of a big crack arising all over an ink absorbing layer, and spoiling the feeling of transparency of an ink absorbing layer.

[0034] Of course, other pigments may be blended if needed in addition to a detailed pigment and adhesives (binder), such as colloidal silica. For example, the various pigments of well-known official business are suitably used in the common coated paper fields, such as an amorphism silica, a kaolin, clay, baking clay, a zinc oxide, tin oxide, magnesium sulfate, an aluminum oxide, an aluminum hydroxide, a calcium carbonate, a satin white, aluminum silicate, a smectite, a zeolite, a magnesium silicate, a magnesium carbonate, magnesium oxide, diatomaceous earth, a styrene system plastics pigment, a urea-resin system plastics pigment, and a benzoguanamine system plastics pigment. However, in order to maintain the smooth nature and transparency of a coating layer, the amount of other pigments used is adjusted to 20% or less to colloidal silica. Moreover, as for the mean particle diameter of the pigment used together, it is desirable that it is 2micro or less.

[0035] Cationic resin may be added and used for the ink absorbing layer of this invention. Thereby, it can raise ink fixable. As cationic resin, polyalkylene polyamine, such as a polyethylene amine and polypropylene polyamine, or the derivative of those, the acrylic resin that has the 3rd class amino group and the 4th class ammonium, a JIAKURIRU amine, etc. are mentioned, for example. in addition, the addition of cationic resin -- the pigment 100 weight section -- receiving -- desirable -- 1 - 30 weight section -- it is more preferably adjusted in the range of 5 - 20 weight section. In addition, various assistants, such as the dispersant used in common coated paper manufacture, a thickener, a defoaming agent, a coloring agent, an antistatic agent, and antiseptics, are added suitably.

[0036] although especially the amount of applications is not what is limited -- 1 - 80 g/m<sup>2</sup> -- desirable -- 4 - 40 g/m<sup>2</sup> Adjusting is desirable. If there are few amounts of applications, even if many [ conversely ], effectiveness is saturated and it is [ that it is easy to produce a crack in a paint film ] meaningless. 15 g/m<sup>2</sup> In order to obtain the above amount of high applications, although it can carry out by high-concentration-izing, it is also possible thickening of application liquid and to realize by two applications or more in addition to it.

[0037] Although the layer containing colloidal silica was explained, when the maximum upper layer and the layer containing the 2nd layer of colloidal silica constitute, the larger one of the maximum upper layer has a desirable particle size of the colloidal silica of the 2nd layer in respect of ink rate of absorption and printing concentration. Although only a colloidal silica layer may constitute an ink absorbing layer (the layer containing the colloidal silica of three or more

layers may constitute, of course), since colloidal silica itself does not have pore, generally its particle interspace space time of the obtained ink absorbing layer is very small. In order to make a colloidal silica layer carry out full absorption also of the ink of a high record concentration part, it is necessary to make [ many ] the amount of applications. When not making [ many ] the amount of high applications of a colloidal silica layer, even if it prepares other ink absorbing layers, the sheet for ink jet record with good high ink rate of absorption made into the purpose of this invention, high printing concentration, high gloss, printing fitness, and water resisting property is obtained.

[0038] In order to maintain the gloss after printing, and a feeling of gloss, it is desirable to be adjusted to the whole ink absorbing layer in the range whose amount of applications of the layer containing colloidal silica is 50 - 100%. Although fixed gloss will be acquired if there are few these rates, about the same gloss as a photograph and a feeling of gloss are hard to be obtained.

[0039] Next, other ink absorbing layers established in the bottom of a colloidal silica content layer are explained concretely. The various pigments of well-known official business are suitably used in the common coated paper fields, such as a non-fixed form silica shown above as a pigment used for other ink absorbing layers, clay, an alumina, and a smectite. A silica and aluminas, such as viewpoints, such as printing concentration, to an amorphism silica, are desirable. The above mentioned adhesives can be used as adhesives (binder). For example, what has PVA, conventionally well-known casein, conventionally well-known starch, etc. is raised. the addition of adhesives -- the pigment 100 weight section -- receiving -- the 5 - 150 weight section -- it is preferably adjusted in the range of 10 - 50 weight section. Moreover, the cationic resin used as a purpose which improves ink fixable can use said shown cationic resin, and an amine system etc. is mentioned. in addition -- as the addition of cationic resin -- the pigment 100 weight section -- receiving -- desirable -- 1 - 30 weight section -- it is more preferably adjusted in the range of 5 - 20 weight section. In addition, various assistants, such as the dispersant used in common coated paper manufacture, a thickener, a defoaming agent, a coloring agent, an antistatic agent, and antiseptics, are also added suitably.

[0040] Although especially the amount of applications of other ink absorbing layers is not limited, either, it is desirable to be adjusted to 3 - 30 g/m<sup>2</sup>. Ink absorption runs short and is not desirable if few. On the other hand, if many [ too ], effectiveness will be saturated, and it is meaningless.

[0041] as the application coating machine for obtaining which ink absorbing layer -- various kinds, such as a blade coating machine, an air knife coater, a roll coater, a bar coating machine, a gravure coating machine, a rod blade coating machine, a lip coating machine, and a curtain coating machine, -- well-known application equipment is mentioned.

[0042] An ink absorbing layer can be formed with application equipment on a base material. Moreover, an ink absorbing layer is formed in a molding side, the interlayer who has adhesives or adhesiveness in a base material (or ink absorbing layer) is prepared, an interlayer and an ink absorbing layer (or base material) can be pasted up, and an ink absorbing layer can be prepared by exfoliating only a molding side. Thus, if an ink absorbing layer is formed using a molding side, the more excellent glossiness will be acquired. Next, application membrane formation of the ink absorbing layer is carried out in a molding side, an interlayer is prepared in a base material, only the case where lamination and a molding side are exfoliated is explained in detail so that an ink absorbing layer and an interlayer may meet, but also when preparing an interlayer in an ink absorbing layer first, since it is clear, that it can carry out similarly overlaps and it is not explained.

[0043] As the adhesion approach, the laminating method (the method of laminating well-known official businesses, such as the dry laminate method, the wet laminating method, the hot melt laminating method, and the extrusion laminating method, is mentioned) is effective. By a wet lamination, dry laminate, and the hot melt laminating method, adhesive resin (thermoplastics which was made to carry out thermofusion and gave the adhesive property), and adhesives are applied to a base material, an interlayer is prepared, after carrying out lamination \*\*\*\*\* so that an interlayer and an ink absorbing layer may meet, a molding side is removed and the desired sheet for ink jet record is obtained. By the extrusion laminating method, thermoplastics (the

same approach is used when using other resin), such as polyethylene by which heating melting was carried out at 280–320 degrees C into the melting extruder, is poured on the surface of a base material, after carrying out cooling sticking by pressure with the molding object and lamination which have an ink absorbing layer, and a cooling roll, a molding object is removed and a desired ink jet record object is acquired.

[0044] When using a pressure sensitive adhesive as the middle class, after using the application approach of well-known official businesses, such as a bar coating machine, a roll coater, and a lip coating machine, and carrying out application desiccation at a base material, a molding side can be removed from an ink absorbing layer and \*\*\*\*\*, and the desired record object for ink jets can be acquired.

[0045] An interlayer's amount of applications is 2 – 50 g/m<sup>2</sup>, even when using any of thermoplastics, adhesives, and a pressure sensitive adhesive, although it does not limit especially if an ink absorbing layer and a base material can be pasted up. It is adjusted so that it may become. If there are few amounts of applications, sufficient adhesive strength is hard to be obtained, on the other hand, even if many, effectiveness is saturated, and it is meaningless.

[0046] As thermoplastics used for the middle class, the thermoplastics of various well-known official businesses, such as ethyl cellulose, vinyl acetate resin and its derivative, polyethylene, an ethylene–vinyl acetate copolymer, polyvinyl alcohol, acrylic resin, polystyrene and its copolymer, a polyisobutylene, hydrocarbon resin, polypropylene, polyamide resin, and polyester resin, is mentioned. As adhesives, the adhesives of various well-known official businesses, such as hydrophilic naturally-occurring-polymers adhesives, such as rubber radical adhesives, such as compound polymer mold adhesives, such as thermosetting resin, such as a urea–resin, phenol resin, an epoxy resin, and Pori isocyanate resin, polyvinyl acetal/phenol resin, rubber/phenol resin, and epoxy/Nylon, and a latex former rubber radical, starch, glia, and casein, are mentioned. As a pressure sensitive adhesive, the pressure sensitive adhesive of various well-known official businesses, such as a solvent mold pressure sensitive adhesive, an emulsion mold pressure sensitive adhesive, a hot melt mold pressure sensitive adhesive, and a delay DOTAIPU pressure sensitive adhesive, can be illustrated.

[0047] As an ingredient used for a molding side, the plates which have high smooth front faces, such as sheets, such as papers, such as films, such as cellophane, polyethylene, polypropylene, plasticized polyvinyl chloride, rigid polyvinyl chloride, and polyester, a polyethylene laminated paper, glassine, an impregnated paper, and vacuum evaporation paper, metal foil, and a synthetic paper, and inorganic glass, a metal, and plastics, are used suitably. Especially, the high polymer film from viewpoints, such as application fitness and the exfoliation fitness of a molding side and an ink absorbing layer, a polyethylene (polyethylene, polypropylene, polyester, etc.) laminated paper, glassine, and inorganic glass are desirable. What has high surface smooth nature is desirable, the surface roughness Ra (JIS B 0601) has desirable 1 micrometer or less, and it is 0.1 micrometers or less more preferably.

[0048] Although no to process is still possible for a molding side, in order to improve the detachability of a molding side and an ink absorbing layer, the resin which has the detachability of silicone, a fluororesin, etc. may be applied to the application side of a molding side. In order to improve printing fitness, it is also effective in a molding side to perform surface hydrophilization by corona discharge or plasma treatment.

[0049] The application process of the ink absorbing layer when imprinting to a base material through an interlayer is contrary to the order of said general application process. That is, the maximum upper layer of an ink absorbing layer is previously applied to a molding side, the 2nd layer is applied on it, and the ink absorbing layer of further others is applied. The ink absorbing layer of the ink jet record object acquired by imprinting to a base material becomes the same built-up sequence as said application sheet in order of the maximum upper layer, the 2nd layer, and other ink absorbing layers.

[0050] 20% or less of the moisture content of the ink absorbing layer when imprinting to a base material through an interlayer is desirable, and it adjusts it to 10% or less more preferably. When watery, the adhesive strength between a molding side and an ink absorbing layer is strong, although a reason is not certain, between the layers of an ink absorbing layer exfoliates, an ink



absorbing layer remains in a molding side, and the adhesive strength has a possibility that a desired ink jet record object may not be acquired, when becoming higher than the reinforcement between layers between ink absorbing layers and removing a molding side.

[0051] The solvent object for dissolving or distributing the coloring matter and this coloring matter for forming an image as ink is used as an indispensable component, and if needed, the dissolution or a distributed stabilizing agent of various dispersants, a surfactant, a viscosity controlling agent, a specific resistance regulator, pH regulator, an antifungal agent, and a record agent etc. is added, and it is prepared.

[0052] Although direct dye, acid dye, basic dye, reactive dye, a food color, a disperse dye, fat dye, various pigments, etc. are raised as a record agent used for ink, a well-known thing can be conventionally used especially without a limit. Although the content of such coloring matter is determined depending on the class of solvent body constituent, the property required of ink, there is especially no problem at use to which it becomes as [ combination / in conventional ink ], i.e., about 0.1 - 20% of the weight of a rate, also in the ink in this invention.

[0053] As a solvent of the ink used by this invention, water and water-soluble, various organic solvents, For example, methyl alcohol, ethyl alcohol, n-propyl alcohol, The alkyl alcohols of the carbon numbers 1-4, such as isopropyl alcohol, n-butyl alcohol, and isobutyl alcohol, A ketone or ketone alcohol, such as an acetone and diacetone alcohol, Polyalkylene glycols, such as a polyethylene glycol and a polypropylene glycol Ethylene glycol, a polo pyrene glycol, a butylene glycol, Triethylene glycol, thiodiglycol, hexylene glycol, Alkylene groups, such as a diethylene glycol, 2-6 alkylene glycol Ether, such as amides, such as dimethylformamide, and a tetrahydrofuran, The low-grade alkyl ether of polyhydric alcohol, such as a glycerol, ethylene glycol methyl ether, the diethylene-glycol methyl (ethyl) ether, and the triethylene glycol monomethyl ether, is mentioned.

[0054]

[Example] Although an example is given to below and this invention is explained more concretely, of course, it is not limited to these. Moreover, unless it refuses, the section in an example and especially % are the solid content except water, and show weight section and weight %, respectively. After processing all the ink jet record objects acquired by this invention by the supercalender (linear pressure: 20 kg/cm), they were used for evaluation. Especially the amount of coating is dry weight unless it refuses. Moreover, in order to avoid the effect of a base material, after all the data of the peak of pore distribution of the ink absorbing layer of the example of this invention and the example of a comparison applied or imprinted the ink absorbing layer to polyester film (the Toray Industries [, Inc. ] make, a trade name: Lumiler T, 75micro), they were used for measurement. All other evaluation results were measured using the ink jet record object acquired in the example or the example of a comparison.

[0055] anionic colloidal silica (the Nissan chemistry company make --) with example 1 mean particle diameter of 80nm Trade name: It is commercial coated paper () so that the amount of applications may become the MP-1040 100 section with 20 g/m<sup>2</sup> by MEIYABA about 15% water solution which mixed the silicon content denaturation PVA(whenever [ Kuraray Co., Ltd. make, trade name:R-3109, degree-of-polymerization:900, and saponification ]: 98.5%)10 section. new Oji Co., Ltd. make, a trade name:O.K. coat, 127.9g/m<sup>2</sup> -- a lamination (what laminated 15-micrometer polyethylene on the coated paper front face by the extrusion laminating method --) Unless it refused especially the following, although "lamination coated paper" showed and carried out the same thing as this, it carried out application desiccation on the front face, and manufactured the ink jet record object of this invention.

[0056] The amount of applications is 15% water solution which mixed the silicon content denaturation PVA(whenever [ Kuraray Co., Ltd. make, trade name:R-2105, degree-of-polymerization:500, and saponification ]: 98.5%)13 section in the anionic colloidal silica (Nissan chemistry company make trade name: Snow tex ZL) 100 section with example 2 mean particle diameter of 85nm at MEIYABA 20g/m<sup>2</sup> Application desiccation was carried out on the front face of lamination coated paper so that it might become, and the sheet for ink jet record of this invention was manufactured. The average pore volume of the obtained application layer is 0.75 ml/g.



[0057] The amount of applications is 15% water solution which mixed the hydroxypropyl-methylcellulose (Shin-Etsu Chemical [ Co., Ltd. ] make trade name: METOROZU 60SH) 18 section in the anionic colloidal silica (Nissan chemistry company make, Snow tex ZL) 100 section with example 3 mean particle diameter of 85nm at MEIYABA 20 g/m<sup>2</sup> Application desiccation was carried out on the front face of lamination coated paper so that it might become, and the body for ink jet record of this invention was manufactured.

[0058] The amount of applications is 15% water solution which mixed the silicon content denaturation PVA(whenever [ Kuraray Co., Ltd. make, trade name:R-2105, degree-of-polymerization:500, and saponification ]: 98.5%)8 section in the anionic colloidal silica (Nissan chemistry company make trade name: Snow tex YL) 100 section with example 4 mean particle diameter of 65nm at MEIYABA 20 g/m<sup>2</sup> Application desiccation was carried out at the above-mentioned application layer so that it might become. The average pore volume of the obtained application layer is 0.6 ml/g.

[0059] The amount of applications is 15% water solution which mixed the silicon content denaturation PVA(whenever [ Kuraray Co., Ltd. make, trade name:R-2105, degree-of-polymerization:500, and saponification ]: 98.5%)8 section in the anionic colloidal silica (Nissan chemistry company make trade name: Snow tex XL) 100 section with example 5 mean particle diameter of 45nm at MEIYABA 20 g/m<sup>2</sup> Application desiccation was carried out at the above-mentioned application layer so that it might become. The average pore volume of the obtained application layer is 0.45 ml/g.

[0060] The amount of applications is 15% water solution which mixed the silicon content denaturation PVA(whenever [ Kuraray Co., Ltd. make, trade name:R-2105, degree-of-polymerization:500, and saponification ]: 98.5%)20 section in the anionic colloidal silica (Nissan chemistry company make trade name: Snow tex C) 100 section with example 6 mean particle diameter of 15nm at MEIYABA 20 g/m<sup>2</sup> Application desiccation was carried out on the front face of lamination coated paper so that it might become. The average pore volume of the obtained application layer is 0.25 ml/g.

[0061] The amount of applications is 15% water solution which mixed the silicon content denaturation PVA(whenever [ Kuraray Co., Ltd. make, trade name:R-2105, degree-of-polymerization:500, and saponification ]: 98.5%)13 section in the cation denaturation colloidal silica (Nissan chemistry company make, trade name:AK-ZL) 100 section with example 7 mean particle diameter of 85nm at MEIYABA 20g/m<sup>2</sup> Application desiccation was carried out on the front face of lamination coated paper so that it might become, and the ink jet record object of this invention was manufactured.

[0062] The amount of applications is 15% water solution which mixed the silicon content denaturation PVA(whenever [ Kuraray Co., Ltd. make, trade name:R-2105, degree-of-polymerization:500, and saponification ]: 98.5%)8 section in the acid anionic colloidal silica (Nissan chemistry company make, trade name:OL) 100 section with example 8 mean particle diameter of 45nm at MEIYABA 20 g/m<sup>2</sup> Application desiccation was carried out on the front face of lamination coated paper so that it might become, and the ink jet record object of this invention was manufactured.

[0063] The amount of applications is 15% water solution which mixed the silicon content denaturation PVA(whenever [ Kuraray Co., Ltd. make, trade name:R-3109, degree-of-polymerization:900, and saponification ]: 98.5%)15 section in the anionic colloidal silica (Nissan chemistry company make, trade name:MP-2030) 100 section with example 9 mean particle diameter of 160nm at MEIYABA 20 g/m<sup>2</sup> Application desiccation was carried out on the front face of lamination coated paper so that it might become, and the ink jet record object of this invention was manufactured.

[0064] The amount of applications is 15% water solution which mixed the silicon content denaturation PVA(whenever [ Kuraray Co., Ltd. make, trade name:R-3109, degree-of-polymerization:900, and saponification ]: 98.5%)18 section in the anionic colloidal silica (Nissan chemistry company make, trade name:MP-3030) 100 section with example 10 mean particle diameter of 250nm at MEIYABA 20 g/m<sup>2</sup> Application desiccation was carried out on the front face of lamination coated paper so that it might become, and the ink jet record object of this

invention was manufactured.

[0065] The amount of applications is 15% water solution which mixed the silicon content denaturation PVA(whenever [ Kuraray Co., Ltd. make, trade name:R-2105, degree-of-polymerization:500, and saponification ]: 98.5%)13 section in the anionic colloidal silica (Nissan chemistry company make trade name: Snow tex ZL) 100 section with example 11 mean particle diameter of 85nm at MEIYABA 15 g/m<sup>2</sup> Application desiccation was carried out on the front face of lamination coated paper so that it might become. Next, the amount of applications is 15% water solution which mixed the silicon content denaturation PVA(whenever [ Kuraray Co., Ltd. make, trade name:R-2105, degree-of-polymerization:500, and saponification ]: 98.5%)8 section in the anionic colloidal silica (Nissan chemistry company make trade name: Snow tex YL) 100 section with a mean particle diameter of 65nm at MEIYABA 10g/m<sup>2</sup> Application desiccation was carried out on the above-mentioned application layer so that it might become, and the ink jet record object of this invention was manufactured.

[0066] 15% water solution which mixed the PVA(Kuraray Co., Ltd. make, trade name-VA-117)30 section and the cationic resin (Sumitomo Chemical Co., Ltd. make, trade name:SR-1001) 15 section is used for the example 12 amorphism silica (trade-name:fine seal [ the Tokuyama make, ] X-45 mean particle diameter: 4.5micro) 100 section, and the amount of applications is 12 g/m<sup>2</sup> at MEIYABA. Application desiccation was carried out at lamination coated paper so that it might become. Furthermore, the amount of applications is 15% water solution which mixed the silicon content denaturation PVA(whenever [ Kuraray Co., Ltd. make, trade name:R-2105, degree-of-polymerization:500, and saponification ]: 98.5%)13 section in the anionic colloidal silica (Nissan chemistry company make trade name: Snow tex ZL) 100 section with a mean particle diameter of 85nm at MEIYABA 8 g/m<sup>2</sup> Application desiccation was carried out on the front face of lamination coated paper so that it might become, and the ink jet record object of this invention was manufactured. The amounts of applications of a colloidal silica layer are 40% of all ink absorbing layers.

[0067] 15% water solution which mixed the PVA(Kuraray Co., Ltd. make, trade name-VA-117)30 section and the cationic resin (Sumitomo Chemical Co., Ltd. make, trade name:SR-1001) 15 section is used for the example 13 amorphism silica (trade-name:fine seal [ the Tokuyama make, ] X-45 mean particle diameter: 4.5micro) 100 section, and the amount of applications is 8 g/m<sup>2</sup> at MEIYABA. Application desiccation was carried out at lamination coated paper so that it might become. Furthermore, the amount of applications is 15% water solution which mixed the silicon content denaturation PVA(whenever [ Kuraray Co., Ltd. make, trade name:R-2105, degree-of-polymerization:500, and saponification ]: 98.5%)13 section in the anionic colloidal silica (Nissan chemistry company make trade name: Snow tex ZL) 100 section with a mean particle diameter of 85nm at MEIYABA 12 g/m<sup>2</sup> Application desiccation was carried out on the front face of lamination coated paper so that it might become, and the ink jet record object of this invention was manufactured. The amounts of applications of a colloidal silica layer are 60% of all ink absorbing layers.

[0068] anionic colloidal silica (the Nissan chemistry company make --) with example 14 mean particle diameter of 85nm trade name: -- the Snow tex ZL100 section -- the silicon content denaturation PVA (the Kuraray Co., Ltd. make --) PET film used as a molding side so that it may become trade name :P 15% water solution which mixed the 13 sections :98.5% whenever [ VA-2105, degree-of-polymerization:500, and saponification ] -- MEIYABA -- the amount of applications -- 20 g/m<sup>2</sup> (the Toray Industries, Inc. make --) 75micro, a trade name: Application desiccation was carried out at Lumiler T and surface roughness Ra=0.02micrometer. Next, the amount of applications is acrylic ester adhesives (the Nippon Carbide Industries [ Co., Inc. ] make, a trade name: A-02) to the front face of lamination coated paper 20g/m<sup>2</sup> Application desiccation was carried out so that it might become. Then, it was stuck by pressure in the calender of \*\*\*\*\* and linear pressure 10 kg/cm so that the above-mentioned ink absorbing layer might meet adhesives. Then, the PET film was removed and the ink jet record object of this invention was manufactured.

[0069] anionic colloidal silica (the Nissan chemistry company make --) with example 15 mean particle diameter of 65nm trade name: -- the Snow tex YL100 section -- the silicon content

denaturation PVA (the Kuraray Co., Ltd. make --) PET film used as a molding side so that it may become trade name :P 15% water solution which mixed the eight sections :98.5% whenever [ VA-2105, degree-of-polymerization:500, and saponification ] -- MEIYABA -- the amount of applications -- 10 g/m<sup>2</sup> (the Toray Industries, Inc. make --) 75micro, a trade name: Application desiccation was carried out at Lumiler T and surface roughness Ra=0.02micrometer. Next, the amount of applications is 15% water solution which mixed the silicon content denaturation PVA (whenever [ Kuraray Co., Ltd. make, trade name-VA-2105, degree-of-polymerization:500, and saponification ] : 98.5%)13 section on the above-mentioned application layer at the anionic colloidal silica (Nissan chemistry company make trade name: Snow tex ZL) 100 section with a mean particle diameter of 85nm at MEIYABA 15 g/m<sup>2</sup> Application desiccation was carried out so that it might become. Next, the amount of applications is acrylic ester adhesives (the Nippon Carbide Industries [ Co., Inc. ] make, a trade name: A-02) to the above-mentioned application layer front face 20 g/m<sup>2</sup> Application desiccation was carried out so that it might become. Then, it was stuck by pressure in the calender of \*\*\*\*\* and linear pressure 10 kg/cm so that adhesives might meet a lamination coated paper front face. Then, the PET film was removed and the sheet for ink jet record of this invention was manufactured.

[0070] anionic colloidal silica (the Nissan chemistry company make --) with example 16 mean particle diameter of 65nm trade name: -- the Snow tex YL100 section -- the silicon content denaturation PVA (the Kuraray Co., Ltd. make --) PET film used as a molding side so that it may become trade name :P 15% water solution which mixed the eight sections :98.5% whenever [ VA-2105, degree-of-polymerization:500, and saponification ] -- MEIYABA -- the amount of applications -- 5 g/m<sup>2</sup> (the Toray Industries, Inc. make --) 75 micrometers, a trade name: Application desiccation was carried out at Lumiler T and surface roughness Ra=0.02micrometer. Next, the amount of applications is 15% water solution which mixed the silicon content denaturation PVA(whenever [ Kuraray Co., Ltd. make, trade name-VA-2105, degree-of-polymerization:500, and saponification ] : 98.5%)13 section on the above-mentioned application layer at the anionic colloidal silica (Nissan chemistry company make trade name: Snow tex ZL) 100 section with a mean particle diameter of 85nm at MEIYABA 10 g/m<sup>2</sup> Application desiccation was carried out so that it might become. Furthermore, 15% water solution which mixed the PVA (Kuraray Co., Ltd. make, trade name-VA-117)30 section and the cationic resin (Sumitomo Chemical Co., Ltd. make, trade name:SR-1001) 15 section in the amorphism silica (trade-name: fine seal [ the Tokuyama make, ] X-45 mean particle diameter: 4.5 micrometers) 100 section is used on the above-mentioned application layer, and the amount of applications is 5 g/m<sup>2</sup> at MEIYABA. Application desiccation was carried out so that it might become.

[0071] Carrying out corona discharge to one side using commercial coated paper (new Oji Co., Ltd. make, a trade name:O.K. coat, and 127.9 g/m<sup>2</sup>) as a base material next, with a melting extrusion coating method (the extrusion laminating method) Polyethylene (Mitsubishi Chemical make trade name: Mitsubishi polyethylene LD) melting liquid (solution temperature: 280-320 degrees C) is applied so that an application layer may become 30 micrometers on a corona discharge front face. Cooling sticking by pressure was carried out with \*\*\*\*\* and a cooling roll so that the polyethylene resin layer of a melting condition and the above-mentioned ink acceptance layer might meet. Then, the PET film was removed and the ink jet record object of this invention was manufactured. The amounts of applications of a colloidal silica layer are 75% of all acceptance layers.

[0072] The amount of applications is 15% water solution which mixed the silicon content denaturation PVA(whenever [ Kuraray Co., Ltd. make, trade name:R-2105, degree-of-polymerization:500, and saponification ] : 98.5%)35 section in the anionic colloidal silica (Nissan chemistry company make trade name: Snow tex XS) 100 section with example of comparison 1 mean particle diameter of 5nm (Sears law measurement) at MEIYABA 20 g/m<sup>2</sup> Application desiccation was carried out on the front face of lamination coated paper so that it might become, and the ink jet record object was manufactured.

[0073] The amount of applications is 15% water solution which mixed the silicon content denaturation PVA(whenever [ Kuraray Co., Ltd. make, trade name:R-2105, degree-of-polymerization:500, and saponification ] : 98.5%)30 section in the anionic colloidal silica (Nissan



chemistry company make and Snow tex S) 100 section with example of comparison 2 mean particle diameter of 9nm at MEIYABA 20 g/m<sup>2</sup> Application desiccation was carried out on the front face of lamination coated paper so that it might become, and the ink jet record object was manufactured.

[0074] The amount of applications is 15% water solution which mixed the silicon content denaturation PVA(whenever [ Kuraray Co., Ltd. make, trade name:R-2105, degree-of-polymerization:500, and saponification ]: 98.5%)20 section in the anionic colloidal silica (Nissan chemistry company make) 100 section with example of comparison 3 mean particle diameter of 400nm at MEIYABA 20 g/m<sup>2</sup> Application desiccation was carried out on the front face of lamination coated paper so that it might become, and the ink jet record object was manufactured.

[0075] In the example of comparison 4 amorphism silica (trade-name: fine seal [ the Tokuyama make, ] X-45 mean particle diameter: 4.5micro) 100 section the PVA(Kuraray Co., Ltd. make, trade name-VA-117)25 section and cationic resin (the Sumitomo Chemical Co., Ltd. make ---) Trade name: Use 15% water solution which mixed the SR-10015 section, and the amount of applications is 10 g/m<sup>2</sup> at MEIYABA. Application desiccation was carried out on lamination coated paper so that it might become, and the ink jet record object was manufactured.

[0076] 10% water solution of example of comparison 5PVA (the Kuraray Co., Ltd. make, trade name-VA-117) is used, and the amount of applications is 20 g/m<sup>2</sup> at MEIYABA. Application desiccation was carried out on lamination coated paper so that it might become, and the ink jet record object was manufactured.

[0077] Pore distribution (shown in Table 1) of the ink jet record form sheet obtained in the [evaluation approach] examples 1-16 and the examples 1-5 of a comparison was measured by the approach shown in the text. The approach shown below estimated a water resisting property, absorptivity, etc. About glossiness and ink absorptivity, the glossiness of the solid part at the time of recording with a commercial ink jet printer (the product made from CANON, trademark:BJC-400J), ink absorptivity, and printing concentration are shown.

[0078] Waterdrop was dropped on the record sheet for [waterproof] ink jets, waterdrop was wiped off after 30 minutes, the part immersed in waterdrop was rubbed by hand, and four steps of water resisting properties were evaluated. (O: Change was not seen at all by the ink acceptance layer.) O : the ink acceptance layer was able to be taken slightly. \*\*: The ink acceptance layer was able to be taken partially. x: The ink acceptance layer was able to be taken completely.

[0079] Evaluation of [ink absorptivity] ink absorptivity observes whether lamination and ink imprint paper of fine quality to paper of fine quality to the printing side printed every 5 seconds from immediately after printing. Time amount until it stops imprinting at all is measured. Four steps of measured numbers of seconds were evaluated (less than [ O:5 second ], O:5 - 10 seconds, \*\*:10 - 30 seconds, and more than x:30 second). The thing for 10 or less seconds excels [ time amount / until ink dries ] in ink absorptivity.

[0080] The printing concentration of the [printing concentration] black solid section was measured using the Macbeth reflection density meter (Macbeth, RD-920). The figure shown in front Naka is the average of 5 times measurement.

[0081] The feeling of gloss of the [feeling of gloss of the printing section (feeling of gloss)] printing section was viewed from the horizontal include angle of 20 degrees to the printing section, and was evaluated four steps as follows.

O : there is a feeling of gloss of color photography and this level.

O : although it is inferior to color photography, there is a high feeling of gloss.

\*\*: Printing \*\*\*\* of coated paper.

x: General PPC \*\*\*\*.

[0082]

[Table 1]



	インク 吸収性	耐水性	印字 濃度	印字部 の光沢	細孔分布のピーク
実施例 1	◎	◎	1.95	○	25nm
" 2	◎	◎	1.91	○	25nm
" 3	◎	○	1.87	○	20nm
" 4	◎	◎	2.03	○	15nm
" 5	○	◎	2.11	○	10nm
" 6	△	◎	2.15	○	3nm
" 7	◎	◎	1.88	○	25nm
" 8	◎	◎	2.20	○	12nm
" 9	◎	◎	1.55	○	50nm
" 10	◎	◎	1.43	△~○	70nm
" 11	◎	◎	2.00	○	15nm、25nm
" 12	◎	◎	1.85	△~○	25nm、15nm*、1.5μ*
" 13	◎	◎	1.91	○	25nm、15nm*、1.5μ*
" 14	◎	◎	1.95	◎	20nm
" 15	◎	◎	2.05	◎	10nm、20nm
" 16	◎	◎	2.10	◎	10nm、20nm、15nm*、1.5μ*
比較例 1	×	○	1.25**	○	<2nm
" 2	×	○	1.35**	○	<2nm
" 3	◎	◎	1.20	×~△	120nm
" 4	◎	△	1.23	×	20nm*、2μ*
" 5	×	×	1.98	△	<2nm*

\*：ポリアクリル酸を主成分とする層以外のインク受容層の細孔分布のピーク。

\*\*：ベタ印字部のインクが完全に吸収されないため、乾いていないインクを拭き取った後、測定した。

[0083]

[Effect of the Invention] The sheet for ink jet record obtained by the configuration of this invention has a water resisting property and good ink absorptivity, and after ink acceptance has high-glossiness and high printing concentration so that clearly from Table 1. The ink jet record object of this invention has high gloss, and has the outstanding ink jet record (printing) fitness, high printing concentration, and moisture-proof and a water resisting property.

[Translation done.]